

Appl. No. 10/676,959
Amdt. Dated April 10, 2006
Reply to Final Office action of February 21, 2006

REMARKS/ARGUMENTS

Claims 1-10 are pending in the present application.

This Amendment is in response to the Final Office Action mailed February 21, 2006. In the Final Office Action, the Examiner rejected claims 1-10 under 35 U.S.C. §103(a). Applicants have amended claim 1 and canceled claims 11-30. Applicants preserve the right to continue prosecuting the canceled claims in the future. Reconsideration in light of the amendments and remarks made herein is respectfully requested.

Rejection Under 35 U.S.C. § 103

In the Office Action, the Examiner rejected claims 1-10 under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 5,988,485 issued to Master et al. ("Master") in view of U.S. Patent No. 6,6,752,309 issued to Parhar ("Parhar"). Applicants respectfully traverse the rejection and contend that the Examiner has not met the burden of establishing a *prima facie* case of obviousness.

To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. *MPEP §2143, p. 2100-129 (8th Ed., Rev. 2, May 2004)*. Applicants respectfully contend that there is no suggestion or motivation to combine their teachings, and thus no *prima facie* case of obviousness has been established.

Master discloses a flux cleaning for flip chip technology using environmentally friendly solvents. Fluxes commonly contain three constituents: a solvent, a vehicle, and an activator (Master, col. 4, lines 8-11). A reflow process consists of a preheat step where the solvent is vaporized (Master, col. 4, lines 12-14).

Parhar discloses water soluble fluxes and methods of using the same. The water soluble fluxes comprise at least one wax carrier (Parhar, col. 1, lines 34-46). The wax carrier may be any fatty carboxylic acid or derivative thereof (Parhar, col. 1, lines 57-58).

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Master and Parhar, taken alone or in any combination, do not disclose, suggest, or render obvious, at least one of (1) applying a flux on a substrate having solder bumps, the flux including at least a solvent and a water soluble monomer or a water soluble polymer; (2) placing a die on the substrate; (3) reflowing the die in a reflow device at a reflow temperature, the reflow temperature having a temperature profile including an increasing region, an approximately constant region, and a decreasing region, (4) the increasing region forming molten polymer flux, and (5) the decreasing region solidifying the molten polymer flux to re-distribute stress caused by thermal mismatch between the die and the substrate.

Master merely discloses that the solder bumps are preheated to a temperature above the melting point of the solder (Master, col. 4, lines 28-31), not above the melting point of the polymer. Therefore, Master does not disclose or suggest forming molten polymer flux in the increasing region. Furthermore, Master discloses that the flux residue areas are formed during the reflow processes and cleaning is required to remove these flux residue areas (Master, col. 4, lines 44-49). Therefore, Master does not disclose or suggest the reflow temperature having the three regions where the increasing region forms molten polymer flux, and the decreasing region solidifies the molten polymer flux to re-distribute stress caused by thermal mismatch between the die and the substrate. To clarify this aspect of the invention, claim 1 has been amended.

Parhar merely discloses a wax carrier to be used in a water soluble flux. Parhar discloses that the water soluble fluxes are in the form of a paste (Parhar, col. 4, lines 36-37). Parhar's teaching aims at avoiding turning water soluble flux in to liquid above 100°F (Parhar, col. 1, lines 24-31). Therefore, Parhar effectively teaches away from the invention.

The Examiner contends that Master discloses a temperature profile inherently including a heating (increasing) temperature, a maintenance (nearly constant) temperature, and a cooling (decreasing) temperature (Final Office Action, page 3, lines 8-11). Applicant respectfully disagrees. Master merely discloses heating to a temperature above the melting point of the solder (Master, col. 4, lines 28-31), followed by a cleaning process to remove the flux residue areas (Master, col. 4, lines 58-59). A cleaning process is not part of the reflow.

The Examiner relies on the theory of inherency to assert that Master discloses the temperature profile. However, the fact that a certain result or characteristic may occur or be present in the prior art is not sufficient to establish the inherency of that result or characteristic.

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In re Rickaert, 9 F.3d 1531, 1534, 28 USPQ2d 1955, 1957 (Fed. Cir. 1993). “To establish inherency, the extrinsic evidence ‘must make clear that the missing descriptive matter is necessarily present in the thing described in the reference, and that it would be so recognized by persons of ordinary skill. Inherency, however, may not be established by probabilities or possibilities. The mere fact that a certain thing may result from a given set of circumstances is not sufficient.’” In re Robertson, 169 F.3d 743, 745, 49 USPQ2d 1949, 1950-51 (Fed. Cir. 1999). “In relying upon the theory of inherency, the examiner must provide a basis in fact and/or technical reasoning to reasonably support the determination that the allegedly inherent characteristic necessarily flows from the teachings of the applied prior art.” Ex parte Levy, 17 USPQ2d 1461, 1464 (Bd. Pat. App. & Inter. 1990) (emphasis in original). Here, Master does not disclose a temperature profile having three regions during the reflow. The fact that during the reflow process the solder bumps are heated to a temperature above the melting point of the solder is not sufficient to establish the inherency of that feature.

Furthermore, there is no motivation to combine Master and Parhar because neither of them addresses the problem of re-distribution of stress caused by thermal mismatch between the die and the substrate. There is no teaching or suggestion that a temperature profile having three regions is present. Master, read as a whole, does not suggest the desirability of forming molten polymer flux and solidifying the molten polymer flux. In addition, it is improper to combine references where the references teach away from their combination. In re Grasselli, 713 F.2d 731, 743, 218 USPQ 769, 779 (Fed. Cir. 1983). Since Parhar teaches away from the combination, combining Master and Parhar is improper. For the above reasons, the rejection under 35 U.S.C. §103(a) is improperly made.

When applying 35 U.S.C. 103, the following tenets of patent law must be adhered to: (A) The claimed invention must be considered as a whole; (B) The references must be considered as a whole and must suggest the desirability and thus the obviousness of making the combination; (C) The references must be viewed without the benefit of impermissible hindsight vision afforded by the claimed invention; and (D) Reasonable expectation of success is the standard with which obviousness is determined. Hodosh v. Block Drug Co., Inc., 786 F.2d 1136, 1143 n.5, 229 USPQ 182, 187 n.5 (Fed. Cir. 1986). “When determining the patentability of a claimed invention which combined two known elements, ‘the question is whether there is something in

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the prior art as a whole suggest the desirability, and thus the obviousness, of making the combination.”” In re Beattie, Lindemann Maschinenfabrik GmbH v. American Hoist & Derrick Co., 730 F.2d 1452, 1462, 221 USPQ (BNA) 481, 488 (Fed. Cir. 1984). To defeat patentability based on obviousness, the suggestion to make the new product having the claimed characteristics must come from the prior art, not from the hindsight knowledge of the invention. Interconnect Planning Corp. v. Feil, 744 F.2d 1132, 1143, 227 USPQ (BNA) 543, 551 (Fed. Cir. 1985). To prevent the use of hindsight based on the invention to defeat patentability of the invention, this court requires the Examiner to show a motivation to combine the references that create the case of obviousness. In other words, the Examiner must show reasons that a skilled artisan, confronted with the same problems as the inventor and with no knowledge of the claimed invention, would select the prior elements from the cited prior references for combination in the manner claimed. In re Rouffet, 149 F.3d 1350 (Fed. Cir. 1996), 47 USPQ2d (BNA) 1453. “To support the conclusion that the claimed invention is directed to obvious subject matter, either the references must expressly or implicitly suggest the claimed invention or the Examiner must present a convincing line of reasoning as to why the artisan would have found the claimed invention to have been obvious in light of the teachings of the references.” Ex parte Clapp, 227 USPQ 972, 973. (Bd.Pat.App.&Inter. 1985). The mere fact that references can be combined or modified does not render the resultant combination obvious unless the prior art also suggests the desirability of the combination. In re Mills, 916 F.2d 680, 16 USPQ2d 1430 (Fed. Cir. 1990). Furthermore, although a prior art device “may be capable of being modified to run the way the apparatus is claimed, there must be a suggestion or motivation in the reference to do so.” In re Mills 916 F.2d at 682, 16 USPQ2d at 1432; In re Fitch, 972 F.2d 1260, 23 USPQ2d 1780 (Fed. Cir. 1992).

In the present invention, the cited references do not expressly or implicitly suggest a temperature profile having three regions. In addition, the Examiner failed to present a convincing line of reasoning as to why a combination of Master and Parhar is an obvious application of solidifying the molten polymer flux to re-distribute stress caused by thermal mismatch between the die and the substrate.

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Therefore, Applicants believe that independent claim 1 and its respective dependent claims are distinguishable over the cited prior art references. Accordingly, Applicants respectfully request the rejection under 35 U.S.C. §103(a) be withdrawn.

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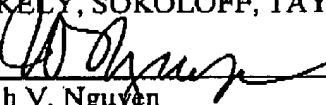
Conclusion

Applicant respectfully requests that a timely Notice of Allowance be issued in this case.

Respectfully submitted,

BLAKELY, SOKOLOFF, TAYLOR & ZAFMAN LLP

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By 
Thinh V. Nguyen
Reg. No. 42,034
Tel.: (714) 557-3800 (Pacific Coast)

12400 Wilshire Boulevard, Seventh Floor
Los Angeles, California 90025

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